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Original Article

Reliability and validity of the Chinese version of CAHS among renal transplant recipients

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ABSTRACT

Purpose: The purpose of this study was to assess the applicability of the Chinese version of Cognitive Appraisal of Health Scale (CAHS) for renal transplant recipients, and to make a preliminary evaluation of its reliability and validity.
Methods: A total of 147 renal transplant recipients who attended a transplant follow-up clinic in a Level 3, Grade A hospital in Beijing were asked to complete the Chinese version of CAHS. Following completion the reliability and validity of the scale were tested.
Results: The Cronbach alpha coefficient of Chinese version of CAHS among subscales of threat, harm, challenge and benign-irrelevant were 0.857, 0.806, 0.680, 0.100 respectively; and the test-retest reliability coefficient were 0.791, 0.601, 0.624, 0.470 ($p < 0.01$). Spearman correlation was used to test the four subscales' correlation between the item score and the total score, in which threat was 0.598–0.748, challenge was 0.517–0.651, harm was 0.528–0.735 and benign-irrelevant was 0.507–0.651. These correlations were all statistically significant. The four common factors were extracted using factor analysis. The four factors accounted for 50.356% of the total variance. The SF-36 Physical Component Summary (PCS) and Mental Component Summary (MCS) scores were correlated with each subscale score in CAHS. Threat was weakly correlated to PCS, and was moderately correlated to MCS; harm was moderately correlated to both PCS and MCS; challenge was weakly correlated to both PCS and MCS and benign-irrelevant did not correlate with neither PCS nor MCS. The Chinese version of CAHS has been shown to have good discriminate and convergent validity.
Conclusion: The Chinese version of the CAHS was supported to be applicable and to provide measurable performance in renal transplant recipients, thus it can be utilized with renal transplant recipients in China.

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End-stage renal disease (ESRD) refers to the clinical syndrome occurring in the late stage of a variety of chronic kidney diseases. Renal transplantation is the most effective and well-accepted method for the treatment of end-stage renal disease currently. With the improvement of transplant technology and the emergence of new immunosuppressive medications, there has been a significant increase in the long-term survival of renal transplant recipients [1]. Thus, renal transplantation has become the best option for patients with end-stage renal diseases. Even so, there are many complications from renal transplantation and side-effects from the medications, which patients will likely endure, such as weight gains, hirsutism, gingival hyperplasia or aches. These lead to frustrating physiological and psychological problems. Many studies show that kidney transplant patients often encounter psychological problems after transplantation; anxiety and depression are the most common. The rate of anxiety was between 17% and 28% [2,3]; the rate of depression was between 22% and 41.4% [4–6]. Some patients contemplated or even attempted suicide. Fear or psychotic symptoms were also seen among the recipients. Alavi [7] and colleagues' study showed that 65.3% and 51.6% of the renal transplant recipients had depression and anxiety respectively. Therefore, renal transplantation is a stressful event for patients. Studies have found that when health conditions change it is very important to determine how the individual views the events in relationship to their well-being [8,9].

Cognitive appraisal is defined as the process by which an individual evaluates or judges a potentially stressful event for meaning and significance to one's own well-being [10]. Cognitive appraisal consists of both primary and secondary dimensions [10]. Primary appraisal is the judgment of an event for meaning and significance to well-being. An event may be evaluated as irrelevant, benign/positive, or stressful (a harm/loss, threat, and/or challenge to well-being) [10]. Secondary appraisal is the evaluation of coping options and available resources [10].

The measurement of appraisal is a relatively new area of study. Most of the appraisal scales were developed within the past two decades. King (1995) measured primary appraisal by single dimensions representing the significance of an illness [11]. However, the evaluation of appraisal on single dimensions is inappropriate because primary appraisal is a multidimensional concept. Oberst and colleagues (1989) developed the Appraisal of Caregiving Scale (ACS) to measure the extent to which cancer patient caregivers perceived the intensity of the illness/caregiving situation as a challenge, threat, harm/loss, or benign [12]. The ACS accurately reflected the construct of primary appraisal; however, its use is limited to studies of caregivers' stress. Other researchers developed the Appraisal of Illness Scale (AIS) to measure the stress appraisal of cancer patients, but the validity and reliability of the AIS were not reported [13,14].

Kessler (1998) developed the Cognitive Appraisal of Health Scale (CAHS) to measure the multiple dimensions of primary and secondary appraisals associated with potentially stressful health-related events [8]. Items of the primary appraisal dimensions were derived from a review of theoretical literature and other existing instruments that measured elements of primary appraisal. Items were constructed until threat, challenge, harm/loss, and benign/irrelevant dimensions were all represented. Four coping and resource items in the secondary appraisal dimensions were developed by Folkman et al. (1986) [15]; one additional secondary appraisal item was added by Kessler (1998) to represent the coping option associated with a benign/irrelevant appraisal. The CAHS was evaluated in a sample of 201 women with breast cancer. Findings indicated the CAHS had good reliability and validity as a measure of cognitive appraisal for health-related events [8].

The Cognitive Appraisal of Health Scale (CAHS) as developed by Kessler includes all dimensions of appraisals and is arguably more comprehensive. The CAHS has been evaluated in Jordanian patients [9,16]. There are no Chinese instruments measuring patients' cognitive appraisal of health. The aim of the study was to translate the CAHS into Chinese and formulate a Chinese version of CAHS, and to assess its reliability and validity in renal transplant recipients. As renal transplantation is a stressful event for renal recipients, it is important to know the cognitive appraisals of these recipients. By knowing the appraisals of the recipients, interventions can be developed to maintain the positive/benign appraisals and alter the negative appraisals, thus improving renal transplant recipients' psychological well-being.

1. Participants and methods

1.1. *Participants*

The convenience sample for the study was composed of 147 patients, recruited from a Level 3 and Grade A hospital in Beijing between January and June 2014. They were all outpatients being followed in renal transplantation unit. The eligibility criteria were: (a) aged above 18 years of age, (b) first renal transplantation, (c) a functional renal graft, (d) certain ability to read and write with good language communication ability, and (e) willingness to participate. The exclusion criteria were: (a) more than one renal transplant, or (b) two or more organ transplantations. The number of participants in this study was 147, conforming to the demand that the sample size be 5 to 10 times of the 23 items.

1.2. *Instruments*

1.2.1. *General data questionnaire*

The questionnaire was designed by the researchers, and contains data related to the illness, gender, age, education level, economic income, work status, source of the graft and postoperative period, etc.

1.2.2. *Cognitive appraisal of Health Scale (CAHS)*

The scale was developed by Kessler and was tested among breast cancer patients in 1998 [8]. The CAHS has 28 items in total, including primary appraisal and secondary appraisal. The primary appraisal scale consist 23 items forming 4 subscales: threat, harm, challenge and benign-irrelevant subscales. The secondary appraisal has 5 items. The Cronbach alpha index of the primary appraisal subscales was 0.85, 0.88, 0.72 and 0.78 respectively. The scale was rated numerically on

a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score indicated more agreement with the appraisal item or scale [8].

Brislin's double translation-back translation practice to scale model transformation was used to translate the scale [17]. Firstly, two translators who were familiar with English and Chinese, and the culture of the two countries respectively translated the scale on their own. One translator had studied and worked in the US for 8 years and has been doing research on Health-related quality of life (HRQOL) in organ transplant recipients for 15 years. A professional researcher was then invited to participate in the comparison of the translated scale. The differences between the two versions were discussed. An agreement was reached after discussion. Next, two bilingual translators (one translator whose native language is English) who were blind to the scale were invited to translate the translated scale back into English. Finally, a committee of experts was formed by all the translators, the researchers and the related experts. The members of the committee critiqued the translated versions and the introduction guide to the questionnaire. After the committee members reached an agreement by discussing every difference, the initial Chinese version of the CAHS was created. Thirty patients who received a renal transplant were invited to complete the initial questionnaire to determine whether it was appropriate to Chinese expression and whether the participants' understanding of the items in the scale was consistent with the researchers' intentions. During the preliminary investigation, item 05 was found to be confusing to participants, "This health condition isn't stressful to me." It was revised into "This health condition is stressful to me." In the end, we formed the Chinese version of CAHS. Psychometric evaluation on the primary appraisal scale was performed in this study.

1.2.3. *Medical Outcomes Study 36-item Short Form (MOS SF-36)*

Health-related quality of life (HRQOL) was measured by the Medical Outcomes Study 36-item Short Form (MOS SF-36), a 36-item self-administered brief questionnaire [18]. The questionnaire was developed by Ware (1992) and was translated into Chinese. It covers 8 domains of physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. The SF-36 consisted Physical Component Summary (PCS) including physical functioning, role-physical, bodily pain, and general health subscales and Mental Component Summary (MCS) including vitality, social functioning, role-emotional, and mental health subscales. Scores of each domain and field ranged from 0 to 100, with higher scores reflecting higher HRQOL. The Cronbach α coefficient of SF-36 PCS and MCS in the study were 0.71 and 0.81 respectively. The SF-36 was used in this study to evaluate the discriminate and convergent validity of the Chinese version of CAHS.

1.3. *Data collection*

The study methodology was approved by the university ethics committee, which requires processes to ensure the confidentiality of all data. Explaining the purpose and meaning of the study to the participants first, and obtaining their consent, the researchers then gave the unified introduction guide to the participants to let them fill in the questionnaires. If the participants had any questions while completing the questionnaires, the researchers would give them an explanation. One-hundred forty seven questionnaires were distributed and 147 questionnaires were returned. The effective questionnaire return-ratio was 100%.

1.4. *Statistical analysis*

SPSS 21.0 software was used to analysis the data. The mean value ±standard deviation, frequency, and the percentage were used to describe the participants' demographic statistic. The two independent sample t-test, Pearson Correlation, and Exploratory Factor Analysis were used to test the reliability and validity of the Chinese version of the CAHS. Statistical significance was set as $P < 0.05$.

2. Results

2.1. *Demographic characteristics of the participants*

The average age of the participants was 42.69 (±11.715) years old, of whom 92 (62.6%) were males, 55 (37.4%) were females. The period after renal transplantation was 36.88 (±31.42) months and 116 (78.9%) cases were within five years. Seventy-eight (53.1%) participants were still employed after transplantation; 76 (51.7%) had a college degree or higher; 98 had a monthly income less than ¥ 5000, and 127 (86.4%) had a graft from a deceased donor. The dialysis period ranged from 0 to 84 months. The demographic characteristics of the participants are shown in Table 1.

Table 1 – Demographic characteristics' of the participants.

Characteristic	N (%)	Mean (SD)	Range
Gender			
Male	92 (62.6%)		
Female	55 (37.4%)		
Age (year)		42.69 (±11.715)	20–78
Education			
Middle school or less	35 (23.8%)		
High School or Technical secondary school	36 (24.5%)		
College degree or above	76 (51.7%)		
Income			
> ¥ 5000	49(33%)		
≤ ¥ 5000	98 (67%)		
Employment			
Employed	78 (53.1%)		
Unemployed	69 (46.9%)		
Source of the graft			
Deceased	127 (86.4%)		
Living	22 (13.6%)		
Post transplant period (month)		36.88 (±31.42)	1–205 m
≤5 years	116 (78.9%)		
>5 years	31 (21.1%)		

2.2. Validity

2.2.1. Content validity

The content validity index, CVI, was used to assess the content validity. The researcher invited 5 experts (all are professors) including 2 nursing experts, one renal transplantation expert, one psychological expert and one instrument expert to make the evaluation. The assessment used three-point method for each item; 1 = unrelated, 2 = uncertain, and 3 = related. The S-CVI/Ave of the Chinese version of the CAHS was 0.92.

2.2.2. Construct validity

Spearman correlation was used to check the relationship between the item score and the 4 subscales total score. The result was; 0.598–0.748 ($p < 0.01$) for the threat subscale, 0.517–0.651 ($p < 0.01$) for the challenge subscale, 0.528–0.735 ($p < 0.01$) for the harm subscale, and 0.507–0.717 ($p < 0.01$) for the benign-irrelevant subscale.

Exploratory factor analysis was used to further test the construction validity of the scale. The Bartlett value was 1187.172, $p < 0.01$ and the KMO value was 0.837, indicating that the scale was fit for the factor analysis. A principal components analysis, followed by varimax rotation and Kaiser Normalization was used. The four factors were extracted according to the eigenvalues and scree plot together (Fig. 1). The 4 factors accounted for 50.356% of the cumulative variance. There were some differences between the 4 factors and the original subscales. For example, Items 5, 9 and 19 belong to Factor 1 threat, while in the original scale, Item 5 belonged to benign-irrelevant; Items 9 and 19 belonged to harm. The Factor Structure Matrix is shown in Table 2.

2.2.3. Discriminate and convergent validity

The SF-36 Physical Component Summary (PCS) and Mental Component Summary (MCS) scores were correlated with each subscale score of the Chinese version of CAHS. Threat was weakly correlated to PCS, and was moderately correlated to MCS. Harm was moderately correlated to both PCS and MCS. Challenge was weakly correlated to both PCS and MCS. Benign–irrelevant was of no correlation with either PCS or MCS. This evidence shows the scale has good discriminate and convergent validity. More details are shown in Table 3.

2.3. Reliability

Internal consistency of the remaining items for the Chinese version of CAHS was assessed using standardized alpha coefficients. The standardized alphas for the subscales were as follows threat 0.857, harm 0.806, challenge 0.680 and benign-irrelevant 0.100. Thirty renal transplantation recipients were chosen for a recheck after 2 weeks, and the result showed that the test-retest reliability coefficient for the four subscales were 0.791, 0.601, 0.624 and 0.470 ($p < 0.01$) respectively.

3. Discussion

3.1. The validity of Chinese version of CAHS

Content validity was assessed using CVI. The higher CVI is, the better items or scales reflect the content of the concept they are measuring. The S-CVI in this study was quite high after 5 relative experts' evaluation, supporting that each item in Chinese version CAHS could well represent the concept of health appraisal.

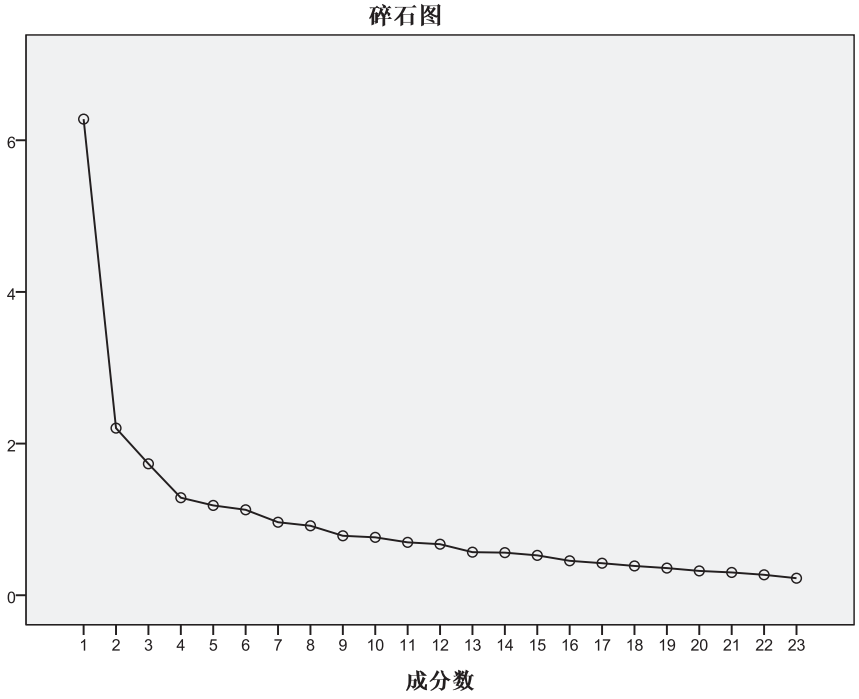

Fig. 1 – The scree plot of Chinese Version of CAHS.

Table 2 – Factor structure matrix of Chinese version of CAHS.

Item	Factor loading			
	1	2	3	4
04 The health condition is frightening to me	.792	–	–	–
09 I have lost interest in the things around me	.779	–	–	–
07 This health condition will not go well	.737	–	–	–
06 Things will only get worse because of this health condition	.729	–	–	–
05 This health condition is stressful to me	.621	–	–	–
19 Relationships with my family and friends have suffered	.610	–	–	–
18 I worry about what will happen to me	.417	–	–	–
10 I have had to give up a great deal because of this health condition	–	.762	–	–
17 I have a lot to lose because of this health condition	–	.623	–	–
13 I have a sense of loss over the things I can no longer do	–	.612	–	–
21 I have been harmed in some way by this health condition	–	.597	–	–
03 I have not been able to do what I want to do because of this health condition	–	.592	–	–
08 This health condition has damaged my life	–	.552	–	–
25 I have been hurt by this health condition	–	.422	–	–
11 I can beat this health condition despite the difficulties	–	–	.688	–
14 I feel I can handle this health condition	–	–	.642	–
02 This health condition won't get me down	–	–	.585	–
01 I can control what will happen to me	–	–	.419	–
15 I have nothing to lose because of this health condition	–	–	.430	–
28 This health condition doesn't affect my life	–	–	.407	–
23 I don't think much about this health condition	–	–	–	.634
26 T here is a lot I can do to overcome this health condition	–	–	–	.452
24 This health condition has caused me to learn more about myself	–	–	–	.418

The correlation index of the item scores in the 4 subscales and the scores of the 4 subscales were more than 0.4 ($p < 0.05$) respectively, indicating that the score of each item was positively related to the score of each subscale. The correlation index between each item was less than 0.8 ($p < 0.05$), indicating that the items were independent and had no repetition.

The study used exploratory factor analysis to extract 4 factors, accounting for 50.356% of the cumulative variance, indicating that the four factors had quite strong explanation of the concept of cognitive appraisal of health. After exploratory factor analysis, some items moved to different subscales. Item 19, "relationships with my family and friends have suffered", and Item 09, "I have lost interest in the things around me", which formerly belonged to the harm subscale, moved to the threat subscale in the study. Item 17, "I have a lot to lose because of this health condition", formerly belonged to threat subscale, but now belonged to harm subscale. Chinese and Americans may understand the concepts of threat and harm differently leading to movement of items between subscales. Item 24, "this health condition has caused me to learn more about myself", and Item 26, "there is a lot I can do to overcome this health condition", formerly belonged to challenge subscale then moved to the benign-irrelevant subscale. This could be explained by cultural differences.

The scores of threat and harm subscale were negatively correlated to the scores of PCS and MCS, which indicated that renal transplant recipients who appraised their health as threatened or harmed had a lower physical and mental quality of life. The score of challenge subscale was positively correlated to the scores of PCS and MCS, which indicated that renal transplant recipients who appraised their health as challenged had higher physical and mental quality of life. The results were consisted with the theoretical and empirical experiences. This suggested that the Chinese version of CAHS had good discriminate and convergent validity.

3.2. *The reliability of CAHS*

Reliability can reflect consistency, or stability of the measuring tool. The higher the reliability of the measurement is, the greater the credible degree of the results will be. Cronbach alpha index is the measurement of the homogeneity or internal correlation between each item. The Cronbach alpha index is scaled as: more than 0.8 is excellent, 0.6–0.8 is good, and less than 0.6 is poor. The alpha index of the four subscales in this study were 0.857 for threat, 0.806 for harm, 0.680 for challenge and 0.100 for benign-irrelevant, indicating that the 3 subscales; threat, harm and challenge, of Chinese version of the CAHS has good internal consistency, while the reliability of benign-irrelevant was quite low. The test-retest reliability coefficients for the four subscales were 0.791, 0.601, 0.624 and 0.470 respectively, indicating that the 3 subscales had good time stability; benign-irrelevant did not. As renal transplantation is a stressful event for the renal transplant recipients, the benign-irrelevant appraisal may not fit in this situation. Further study is needed to evaluate the reliability of the benign-irrelevant subscale.

4. Conclusion

As is discussed previously, the Chinese version of CAHS has good reliability and validity, and can measure the primary

Table 3 – The correlation between PCS and MCS of SF-36 and CAHS subscales among renal transplant recipients.

		Threat	Harm	Challenge	Benign-irrelevant
PCS	Correlation coefficient	−.269**	−.356**	.304**	.049
	Sig. (2-tailed)	.001	.000	.000	.558
MCS	Correlation coefficient	−.411**	−.376**	.177*	.095
	Sig. (2-tailed)	.000	.000	.032	.250

* indicated P < 0.05, ** indicated P < 0.01.

appraisal of health in renal transplant recipients. This study is beneficial to further understand the concept of cognitive appraisal of health, and to provide a practical tool for health professionals to assess and measure cognitive appraisal of health of renal transplant recipients. Larger sample sizes are needed to further assess the Chinese version of the CAHS.

Author contributions

LIU conceived the study, designed the study, and obtained research funding. ZHANG and LIU supervised the conduct of the study and data collection. Shang and Peng undertook recruitment of participants and managed the data, including quality control. XIE provided statistical advice on study design and analyzed the data; LIU chaired the data oversight committee. ZHANG drafted the manuscript, and all authors contributed substantially to its revision. LIU takes responsibility for the paper as a whole.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.ijnss.2015.05.001

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